Sun Catchers

Primary Curriculum	Grade 5
Supplemental Curriculum	Grades 4–5+
Notes	Standard unit/refill kit comes with enough materials for 30 students.

Description

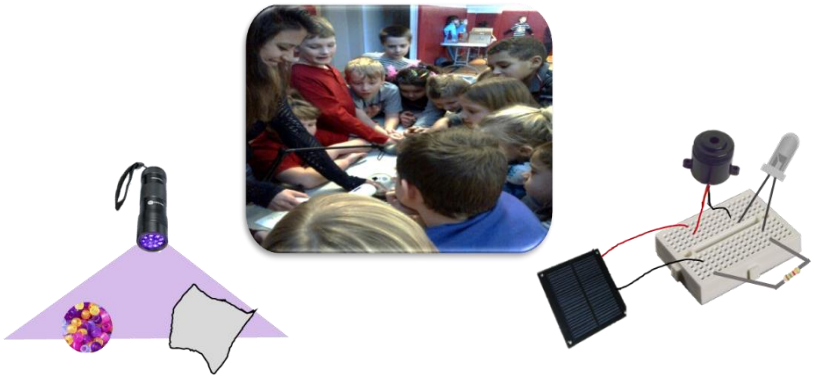
How can you use solar energy to solve a challenge you face?

Did you know that in ONE HOUR enough energy from the sun hits the Earth to supply all the power we need for things like heating our homes, running our electronics, and powering our schools and hospitals? Learn how people like Erica at GRID Alternatives are working to ensure every community has access to renewable resources.

Using the overarching question of "How do we use various forms of solar energy to solve challenges in our lives?" students explore the power and importance of the sun both as an energy source and a member of the cosmos, as they ask themselves: *"What are all the different ways we rely on the sun and what is the evidence of its importance in our lives?"*

Main Investigations

Solar Sleuthing



WATT's Cooking?

Number of Lessons*

Full unit – 27 lessons
Supplemental program – minimum 5 lessons

**Lesson = 30–40 min. block, 50% of full unit lessons can be delivered in non-science classes*

Best Suited For

- Classroom science instruction

Overarching Enduring Understanding

What are all the different ways we rely on the power of the sun and what is the evidence of its importance in our lives?

Number of Lessons*

Full unit – 27-30 lessons

Supplemental program – minimum 5 lessons

**Lesson = 30 – 40 min block, 50% of full unit lessons can be delivered in non-science classes*

FLOW OF INSTRUCTION

Investigation: Some Like It Hot! (hands-on investigation, occurs during week 1)

In this investigation students get their first look at the connection between light and heat. From this they will start building a model to explain their observations based on the fact that matter is made up of particles too small to be seen. They will expand and revise this model throughout the Solar Sleuthing activities.

Investigations: Solar Sleuthing (hands-on investigations, occur during weeks 1, 2, 3, and 4)

In this series of smaller investigations students investigate various attributes of the sun.

- In **Light. Heat. Motion!** students continue exploring the connection between light, energy, and particles.
- In **Color Creations** students investigate different properties of light, light-blocking materials, and the idea of light-sensitive molecules.
- In the short research activity **Follow the Energy** students develop, use, and explain models to describe different ways we use energy from the sun.
- In the short research activity **Star Light, Star Bright** students research and report out on evidence that supports an argument focused on the differences in apparent brightness of the sun compared with other stars as well as the seasonal changes of some stars in the sky.
- In **Solar Circuits** students get some hands-on experience with solar cells.

At the end of the series of Solar Sleuthing activities, students must use the knowledge they have gained to develop a model to describe that matter is made up of particles too small to be seen.

Investigation: Solar Solutions (summative challenge, occurs during weeks 5, 6, 7, and 8)

After having discussed and investigated all the different ways the sun plays a role in our lives, students will apply that knowledge toward the development of a *solar solution*. Working in teams of four or five, students must describe three innovations or discoveries that were made possible by our understanding of the sun that have helped to protect the Earth's resources and the environment. Then students must describe a problem or challenge that could be solved (or improved) with the help of the sun and design a device or test or similar based on that problem.

Investigation: WATTs Cooking? (hands-on investigation, occurs during weeks 2 through 6)

Working in groups, students begin this project by researching solar ovens and reporting out on how they work and their assessment of critical design criteria. Groups must then determine their plan for oven construction, build their ovens, and determine the plan for testing. Part of their plan must include gathering data (both from reference resources and firsthand) on the sunlight available at different places around the school and throughout the day/year. This includes collecting and tabulating data about patterns in sunlight and shadows. From this data students should finalize and execute their testing plan, reflect on their design, and plan improvements in design or process. [Note: Depending on where you are located, it may be fun to perform the testing throughout the year.]

Parts List

Full Unit

Printed Materials

- Educator Guide
- Individual *My STEM Stories*™ notebooks
- Individual *My STEM Explorer Notes*™ notebooks
- Timeline sheets
- Introductory investigation data recording sheets
- Follow the Energy sorting cards

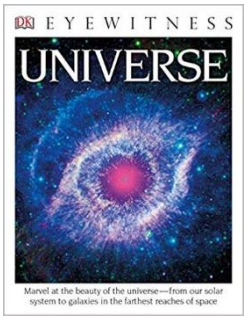
Provided Equipment & Materials

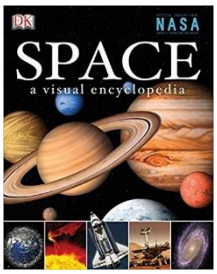
- Infrared thermometer (4)
- Radiometers (4)
- UV flashlights (5)
- UV-sensitive beads
- Normal beads
- Light-blocking materials
- key chain rings
- Cord materials
- Multimeter
- Wired solar panels (7)
- Mini breadboards (6)
- Jumper wires (set of 30)
- LEDs with resistors (class set)
- Buzzers (five at 3–24 V)
- Light meter
- Dowels

Common Equipment & Materials Needed but NOT Provided

- Light sources
- Cardboard boxes
- Insulation material (newspaper works well)
- Black and white paint
- Aluminum foil
- Glue or strong tape
- Something to cook (we suggest cookies)

Trade Books





- *National Geographic Kids Everything Space. by Helaine Becker*
- *Space: A Visual Encyclopedia*
- *DK Eyewitness Books: Universe*

Digital Resources

- Electronic copies of printed materials
- How-To videos for investigations
- Easy-to-use links to publicly available videos and other information.

Supplemental Unit

Printed Materials

- Educator Guide
- Individual *My STEM Stories*™ notebooks
- Individual *My STEM Explorer Notes*™ notebooks
- Timeline sheets
- Introductory investigation data recording sheets

Provided Equipment & Materials

- Radiometers (4)
- UV flashlights (5)
- UV-sensitive beads
- Normal beads
- Light-blocking materials
- key chain rings
- Cord materials
- Multimeter
- Wired solar panels (7)
- Mini breadboards (6)
- Jumper wires (set of 30)
- LEDs with resistors (class set)
- Buzzers (five at 3–24 V)
- Dowels

Common Equipment & Materials Needed but NOT Provided

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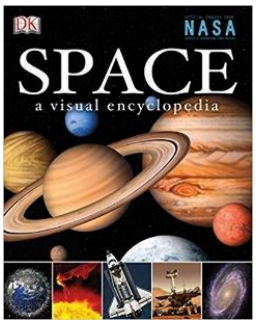

- *National Geographic Kids Everything Space. by Helaine Becker*
- *Space: A Visual Encyclopedia*

Digital Resources

- Electronic copies of printed materials
- How-To videos for investigations
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Refill Kit

Printed Materials

- Educator Guide
- Individual *My STEM Stories*™ notebooks
- Individual *My STEM Explorer Notes*™ notebooks
- Timeline sheets
- Introductory investigation data recording sheets

Provided Equipment & Materials

- UV-sensitive beads
- Normal beads
- Light-blocking materials
- key chain rings
- Cord materials
- Multimeter
- Wired solar panels (1)
- Mini breadboards (1)
- Jumper wires (10)
- LEDs with resistors (10)
- Buzzers (1)
- Dowels

Digital Resources

- Electronic copies of printed materials1
- How-To videos for investigations1
- Easy-to-use links to publicly available videos and other information.

Overarching Enduring Understanding

What are all the different ways we rely on the power of the sun and what is the evidence of its importance in our lives?

Number of Lessons*

Full unit – 27-30 lessons

Supplemental program – minimum 5 lessons

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FLOW OF INSTRUCTION

5-PS1-1

Develop a model to describe that matter is made of particles too small to be seen.

5-PS3-1

Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

5-ESS1-1

Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.

5-ESS3-1

Obtain and combine information about ways individual communities use science ideas to protect Earth's resources and environment.

5-ESS1-2

Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

3-5-ETS1-1

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2

Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3

Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Investigation: Some Like It Hot! (hands-on investigation, occurs during week 1)

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Investigations: Solar Sleuthing (hands-on investigations, occur during weeks 1, 2, 3, and 4)

In this series of smaller investigations students investigate various attributes of the sun.

- In **Light. Heat. Motion!** students continue exploring the connection between light, energy, and particles. (5-PS1-1)
- In **Color Creations** students investigate different properties of light, light-blocking materials, and the idea of light-sensitive molecules. (5-PS1-1)
- In the short research activity **Follow the Energy** students develop, use, and explain models to describe different ways we use energy from the sun. (5-PS1-1, 5-PS3-1)
- In the short research activity **Star Light, Star Bright** students research and report out on evidence that supports an argument focused on the differences in apparent brightness of the sun compared with other stars (5-ESS1-1) as well as the seasonal changes of some stars in the sky. (5-ESS1-2)
- In **Solar Circuits** students get some hands-on experience with solar cells.

At the end of the series of Solar Sleuthing activities, students must use the knowledge they have gained to develop a model to describe that matter is made up of particles too small to be seen. (5-PS1-1)

Investigation: Solar Solutions (summative challenge, occurs during weeks 5, 6, 7, and 8)

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Investigation: WATTs Cooking? (hands-on investigation, occurs during weeks 2 through 6)

Working in groups, students begin this project by researching solar ovens and reporting out on how they work (5-PS-1-1) and their assessment of critical design criteria (3-5-ETS1-1). Groups must then determine their plan for oven construction, build their ovens (3-5-ETS1-2), and determine the plan for testing (3-5-ETS-1-3). Part of their plan must include gathering data (both from reference resources and firsthand) on the sunlight available at different places around the school and throughout the day/year. This includes collecting and tabulating data about patterns in sunlight and shadows (5-ESS1-2). From this data students should finalize and execute their testing plan, reflect on their design, and plan improvements in design or process (3-5-ETS1-3) [Note: Depending on where you are located, it may be fun to perform the testing throughout the year.]